Blue Planet Solutions Gulf Coastal Response Plan
-Executive Summary

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Visual Slides Accompanying Speech by Mr. Kevin Costner

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The Role of Advanced Oil-Water Separation Technology in Oil Spill Response
-A White Paper by Blue Planet Solutions

Prepared for:

Committee on Homeland Security
U.S. House of Representatives

September 22, 2010

Executive Summary

The Problem:

The surface oil spill response to the Deep Water Horizon Gulf of Mexico Spill was comprised of an assortment of "vessels of opportunity" as well as committed resources from oil spill response organizations representing varying levels of equipment, personnel, and response methods. The effectiveness of the overall surface response program was apparent from the nightly images of oil-soaked birds, tarballs on the Gulf Coast beaches, and oil sludge penetrating to inland waterways.

Although major oil companies have committed $1B to developing subsurface leak prevention and containment to-date, there is a critical need for a surface response employing state-of-the-art booms, skimmers, oil-water separators, shallow and deep water oil spill response vessels (OSRVs), and ample oil storage and transport vessels. In addition, a responsible oil spill response plan will integrate sub-surface and surface responses with satellite and aerial intelligence from multiple agencies as well as trained experts, volunteers, equipment and facilities for beach and wildlife cleanup and decontamination.

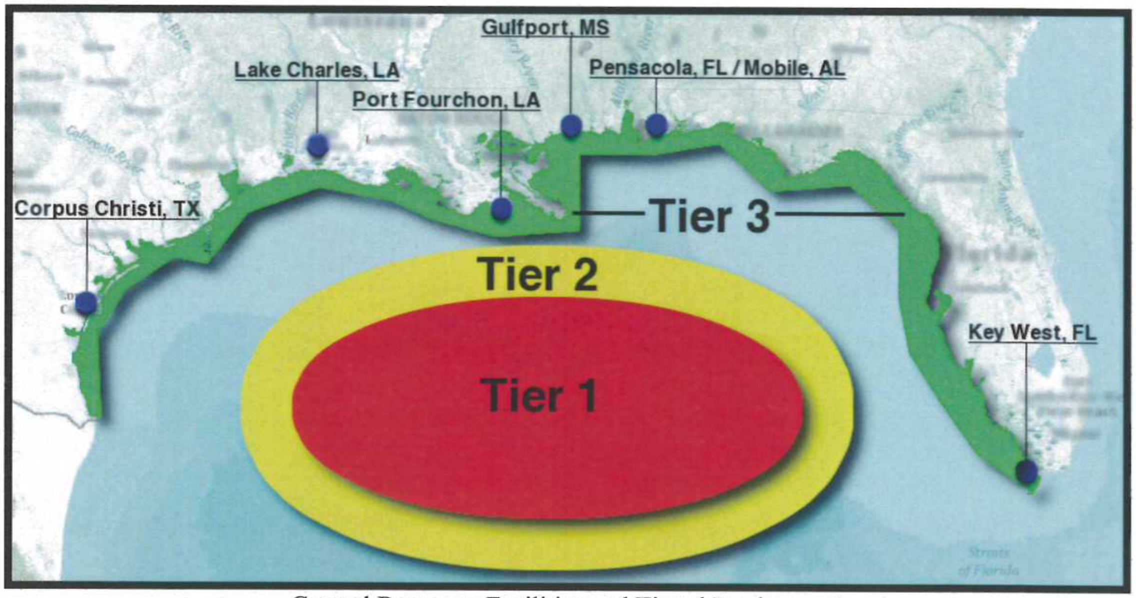
We believe the traditional approach of burning collected oil should be eliminated with the introduction of our more efficient and environmentally friendly oil recovery and processing technology. Moreover, chemical dispersants do not recover spilled oil nor do they remove it from the environment. In fact, dispersants increase environmental risk by increasing ecosystem exposure to spilled oil. The only responsible action is a serious effort to remove oil from the water. The use of burning, dispersants, and absorbent media should be minimized and relied upon only as a last resort.

The Solution:

Blue Planet Solutions is taking a different approach to oil spill recovery, one that does not primarily rely on dispersants, burning, and recruiting vessels after the spill. Based on our experience in the Deepwater Horizon oil spill in the Gulf of Mexico, it is clear that a more integrated oil spill response is required.

We propose a comprehensive surface response plan to work in conjunction with the sub-surface oil spill prevention and containment plan put forth by the major oil companies. Continuous intelligence will be provided by local, state, and federal agencies in charge (state DEQ, US EPA, USCG, NOAA, etc.) and coordination by the designated incident command center. This plan is based upon research, development, and adaptation of the best available technology, which has not been the case for the better part of two decades. During the Deep Water Horizon spill, there were 6000 vessels registered to aid in the cleanup effort. Our initial plan achieves far greater efficiency and reduces the number of vessels required from 6000 to less than 200.

This proactive response gives the people of the Gulf Coast the protection and security they deserve and an efficiency that has been non-existent. It represents a three-tiered approach that should be adopted by a mature industry.



Coastal Response Facilities and Tiered Deployment

Tier 1: Rapid Initial Response	
• 40 Existing Platform Service Vessels (PSVs) retrofitted with advanced oil spill recovery equipment (AOSRE) including state-of-the-art booms, skimmers, oil-water separation systems, and oil storage tanks	• Deployed to spill site within 2-3 hours • Each boat can process and store 12,000 barrels (bbl) of skimmed oil and water per day
Tier 2: Overwhelming Support	
• 30 Existing Offshore Supply Vessels (OSRVs) retrofitted to be equipped (at all times) with AOSRE	• Vessels loaded with AOSRE at Coastal Response Facilities (CRFs) via crane within 24 to 48 hours • Processing and storage capacity of 6,000 bbl per vessel
• 10 Existing Deep Water Barges (DWBs) able to accept AOSRE from designated Coastal Response Facilities	• Deployed to spill site within 36 to 96 hours • Processing and storage capacity of 85,000 to 115,000 barrels per barge/vessel
Tier 3: Shoreline Protection	
• 100 Shallow Water Skimming Vessels (SWSVs) to protect Gulf coast shoreline with AOSRE.	• Deployed to spill site within 36 to 72 hours • 249 bbl processing/storage capacity
• 10 Shallow Water Barges (SWBs) able to accept AOSRE from designated Coastal Response Facilities to serve as processing/storage/transport centers for oil and water collected by vessels of opportunity	• Deployed to spill site within 24 to 48 hours • Processing and storage capacity of 10,000 bbl per barge
• 6 Coastal Response Facilities (CRF) • Shoreline and Wildlife Cleanup	• Training, equipment storage, inspection and maintenance • Coordination of a wide range of wildlife response equipment utilized by trained wildlife response experts

The Cost and Timeframe:

The proposed upfront cost for this program is estimated at $895M. A detailed deployment schedule for OSRVs and AOSRE over the next 24 months is provided below.

Deployment Schedule

	2010		2011												2012					
Deployment Date	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total
Platform Service Vessels			8				8				8				8				8	
Total PSVs			8				16				24				32				40	40
Offshore Supply Vessels			10				10				10									
Total OSVs			10				20				30									30
Deep Water Barges								5		5										
Total DWBs								5		10										10
Shallow Water Barges				5		5														
Total SWBs				5		10														10
Shallow Water Skimming Vessels	10	10	10	10	10	10	10	10	10	10										
Total SWSVs	10	20	30	40	50	60	70	80	90	100										100
Coastal Response Facilities			2				2				2									
Total CRFs			2				4				6									6

As shown above, there will be a total of 48 vessels in operation by January 2011. These include 10 Offshore Supply Vessels, 8 Platform Service Vessels and 30 Shallow Water Skimming Vessels built, equipped and deployed around the shores of the gulf with advanced oil spill recovery technology onboard. By mid-2012, the entire fleet of 190 vessels will be in operation.

The Benefits of Blue Planet Solutions Oil Spill Response Program:

(1) Returning skimmed water back to the ocean at under 15ppm (Exceeding EPA Regulations)

(2) Minimizing the use of toxic dispersants

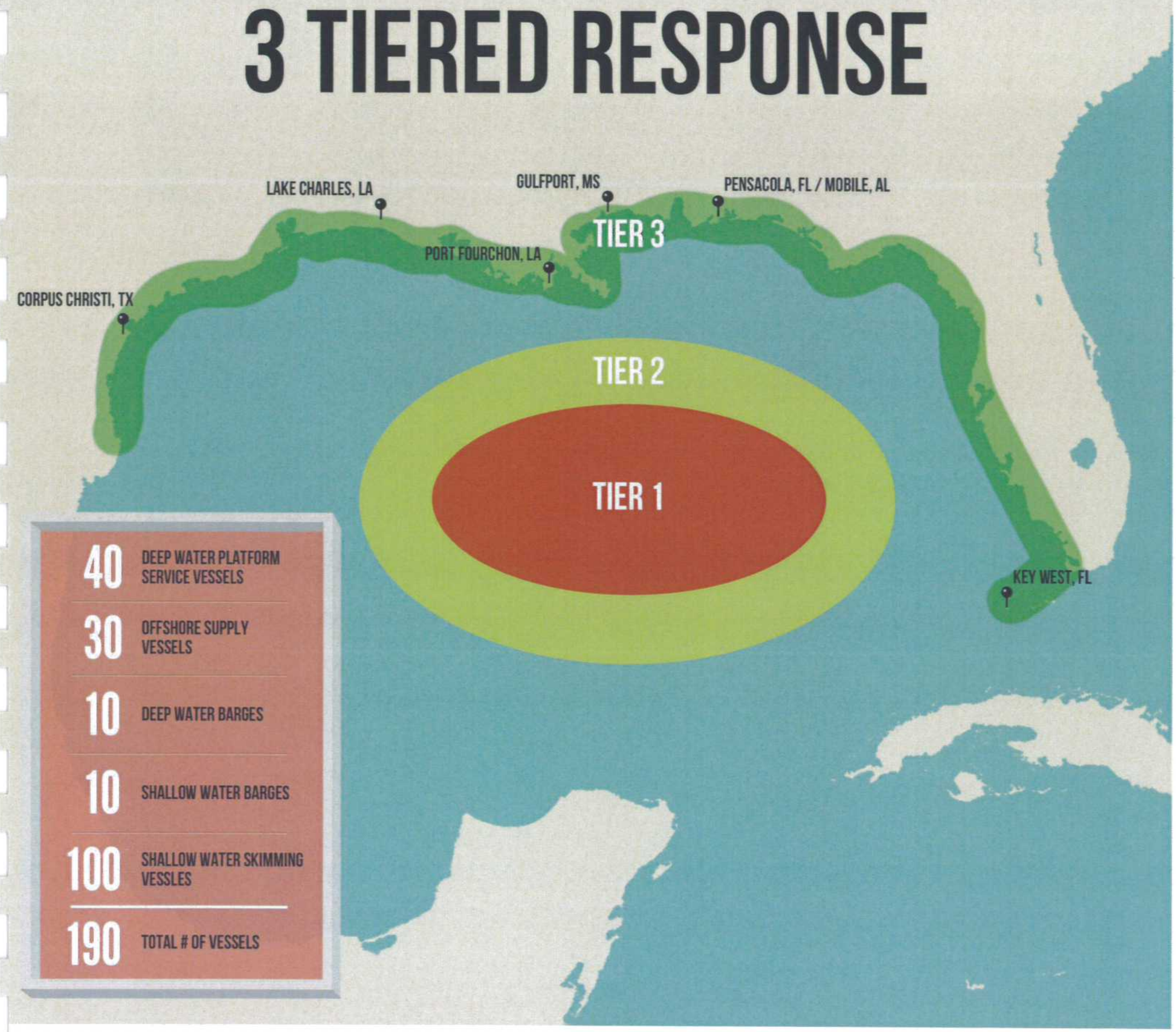
(3) Avoiding air pollution and carbon emissions associated with burning boomed oil

(4) Eliminating disposal or incineration of hazardous waste absorbent media

(5) Providing a highly efficient and overwhelming response with only 190 vessels instead of more than 6,000 as used during the Deep Water Horizon spill

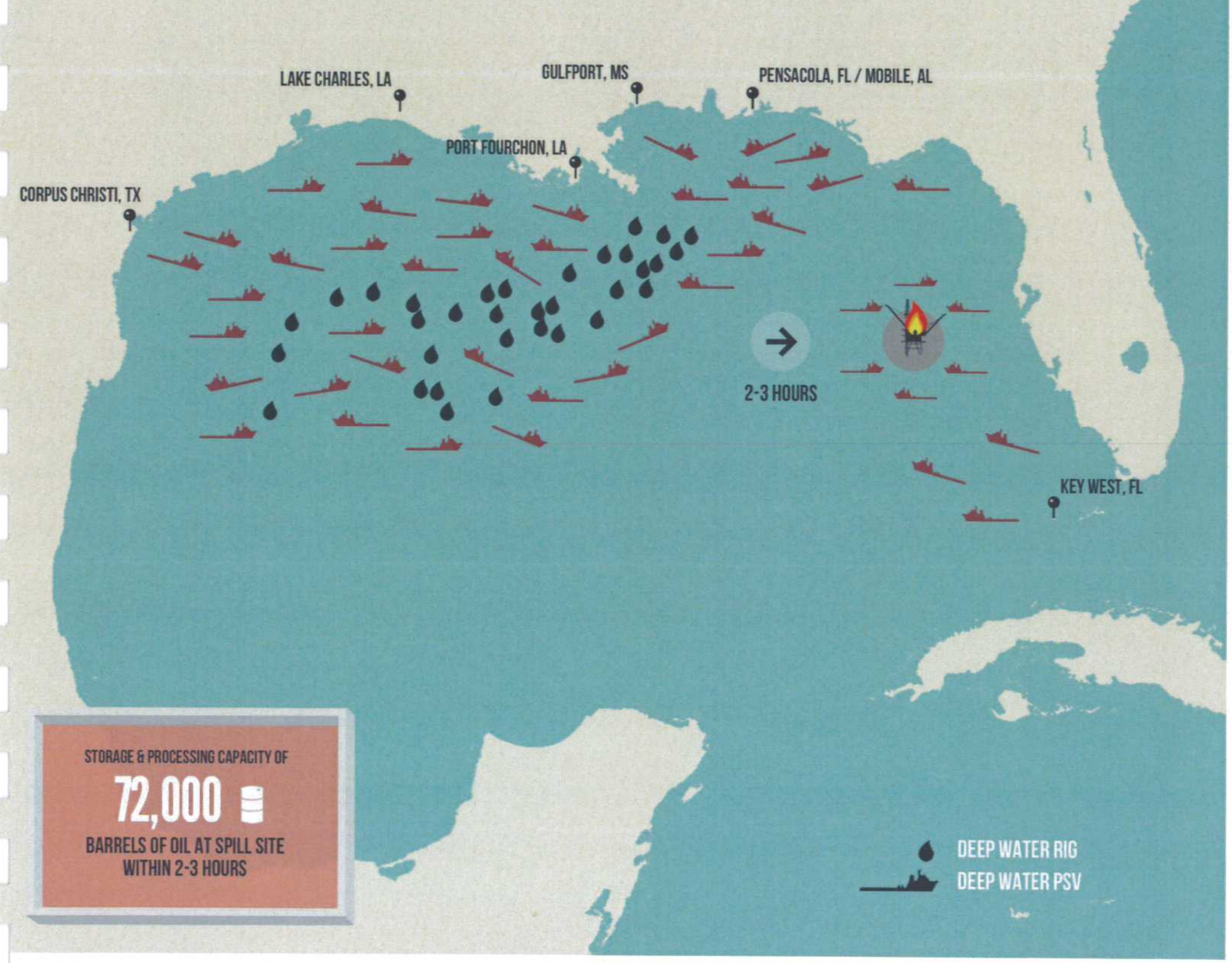
(6) The transporting of shallow water skimming vessels that can then be trucked or airlifted to a spill site to ensure shoreline protection

(7) Protecting and preserving the health of the Gulf Coast beaches and ecosystems


3 TIERED RESPONSE
LAKE CHARLES, LA
GULFPORT, MS
PENSACOLA, FL / MOBILE, AL
TIER 3
PORT FOURCHON, LA
CORPUS CHRISTI, TX
TIER 2
TIER 1
KEY WEST, FL
40 DEEP WATER PLATFORM SERVICE VESSELS
30 OFFSHORE SUPPLY VESSELS
10 DEEP WATER BARGES
10 SHALLOW WATER BARGES
100 SHALLOW WATER SKIMMING VESSLES
190 TOTAL # OF VESSELS

DEEP WATER PSV

INITIAL RESPONSE



OVERWHELMING SUPPORT
LAKE CHARLES, LA
GULFPORT, MS
PENSACOLA, FL / MOBILE, AL
PORT FOURCHON, LA
CORPUS CHRISTI, TX
KEY WEST, FL
STORAGE & PROCESSING CAPACITY OF
1,500,000
BARRELS OF OIL IF ALL NINETY (90) VESSELS WERE DEPLOYED TO ONE SPILL SITE.
DEEP WATER PSV WITHIN 48 HOURS
OFFSHORE SUPPLY VESSELS WITHIN 48 HOURS
DEEP WATER BARGES WITHIN 96 HOURS


MULTI-SPILL SITUATION
LAKE CHARLES, LA
GULFPORT, MS
PENSACOLA, FL / MOBILE, AL
PORT FOURCHON, LA
CORPUS CHRISTI, TX
KEY WEST, FL
STORAGE & PROCESSING CAPACITY OF OVER
300,000
BARRELS OF OIL
PER SPILL LOCATION
DEEP WATER PSV
OFFSHORE SUPPLY VESSELS
DEEP WATER BARGES

SHORELINE PROTECTION

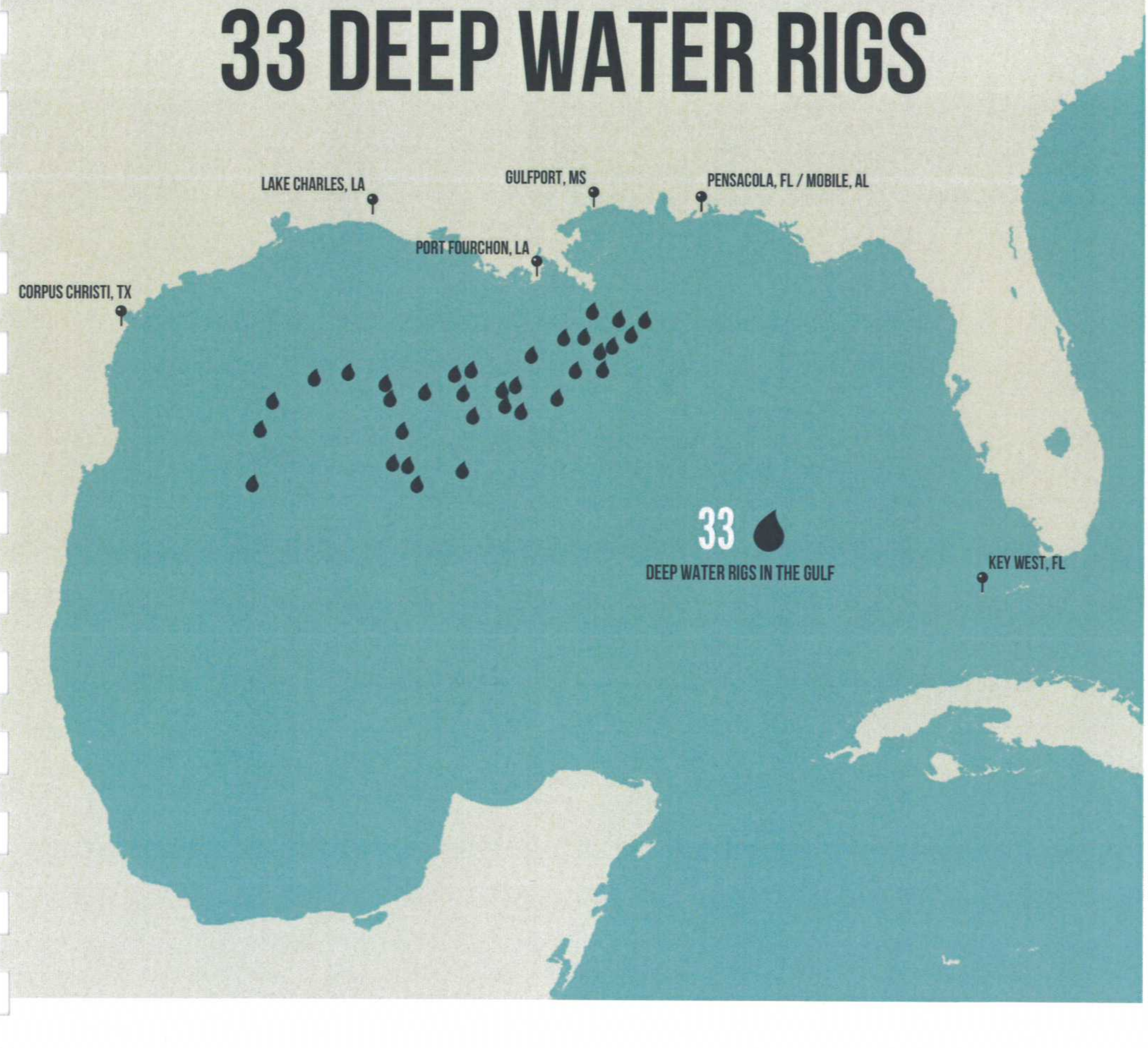

33 DEEP WATER RIGS
LAKE CHARLES, LA
GULFPORT, MS
PENSACOLA, FL / MOBILE, AL
PORT FOURCHON, LA
CORPUS CHRISTI, TX
33
DEEP WATER RIGS IN THE GULF
KEY WEST, FL

Fig. A

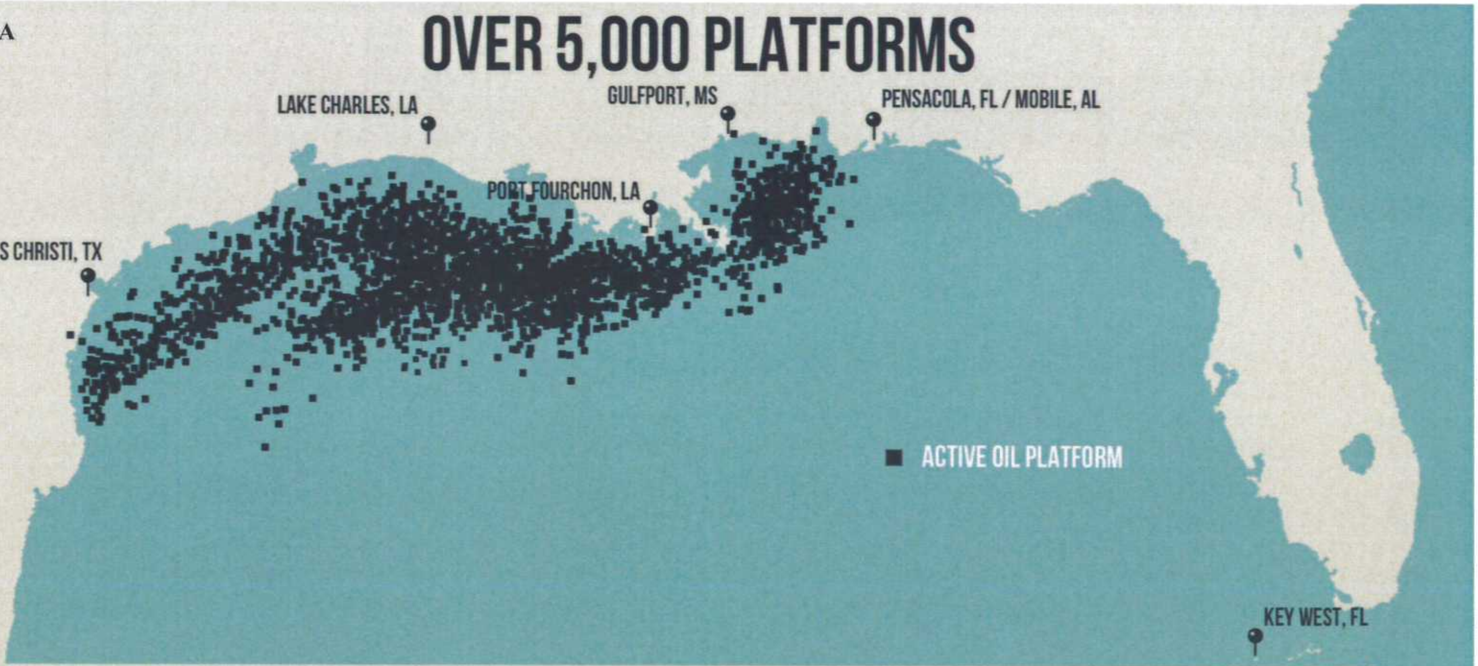


Fig. B

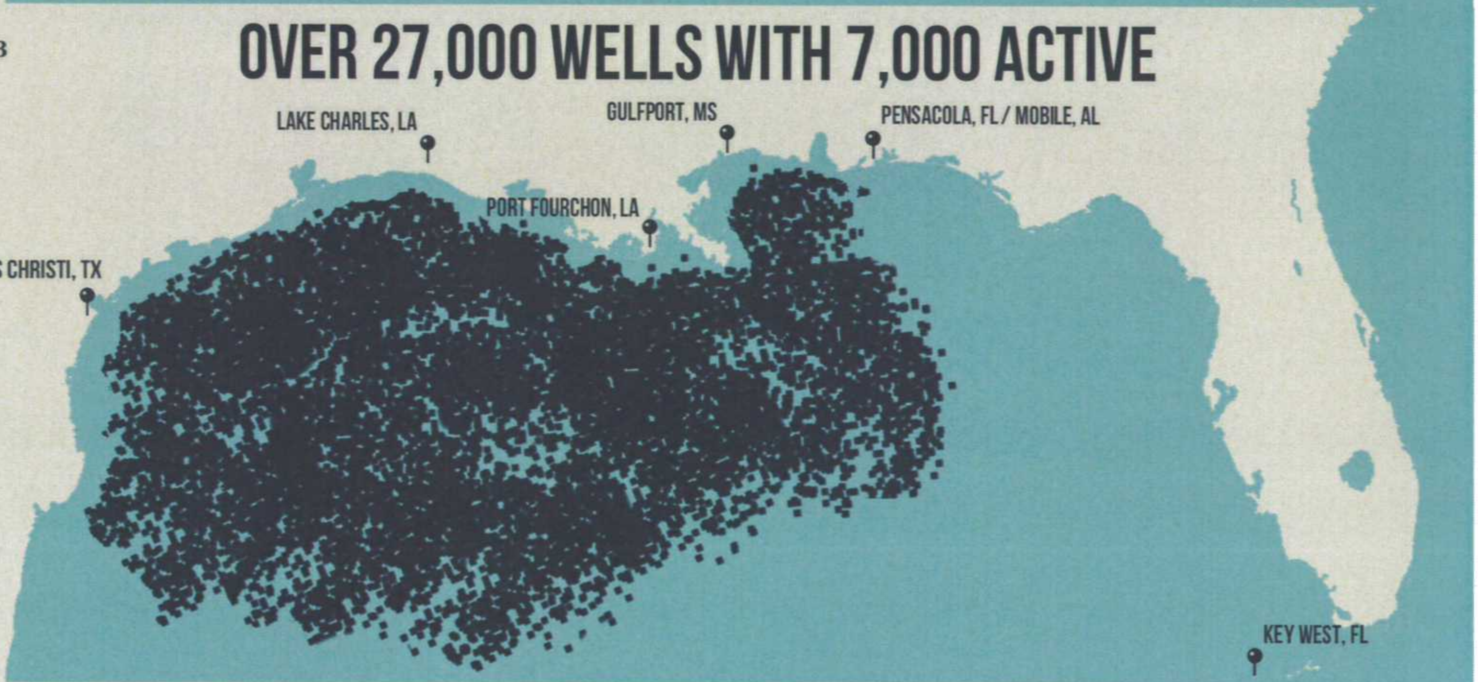
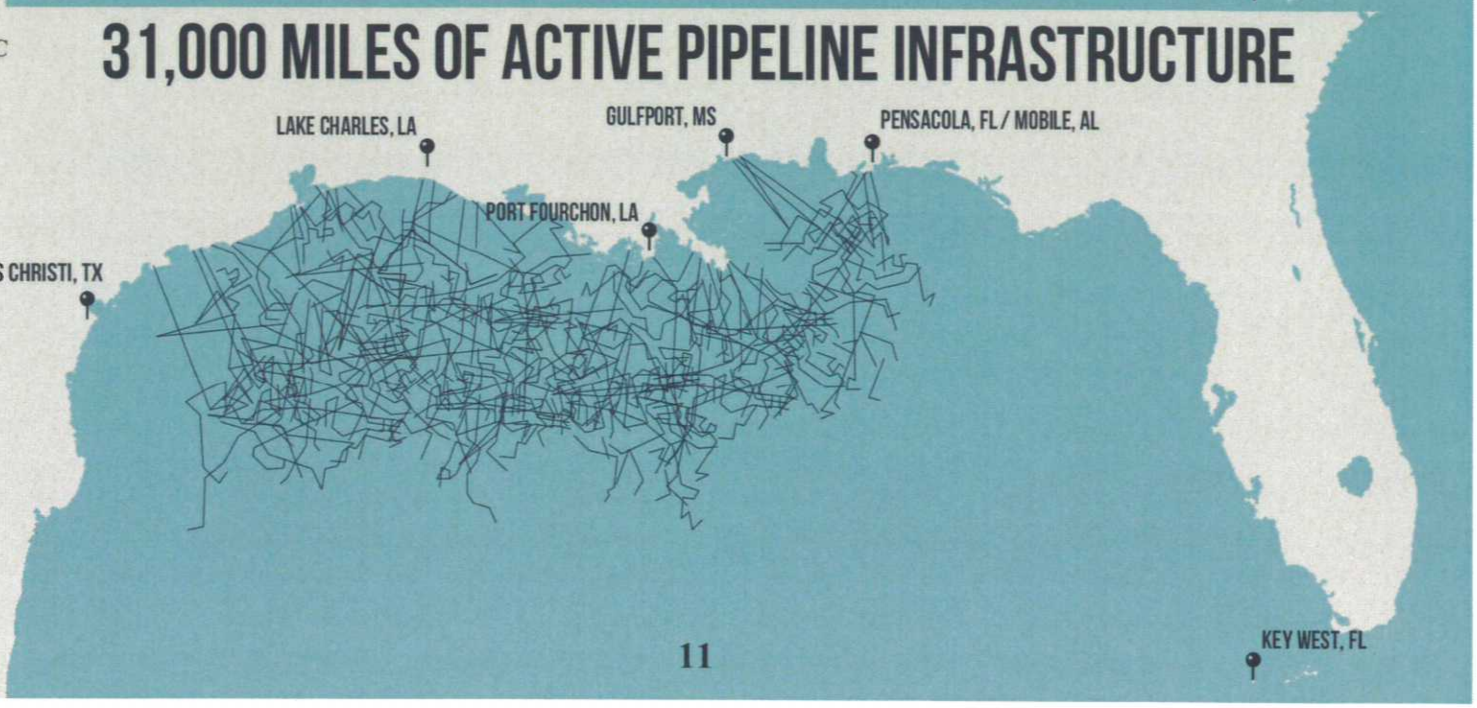
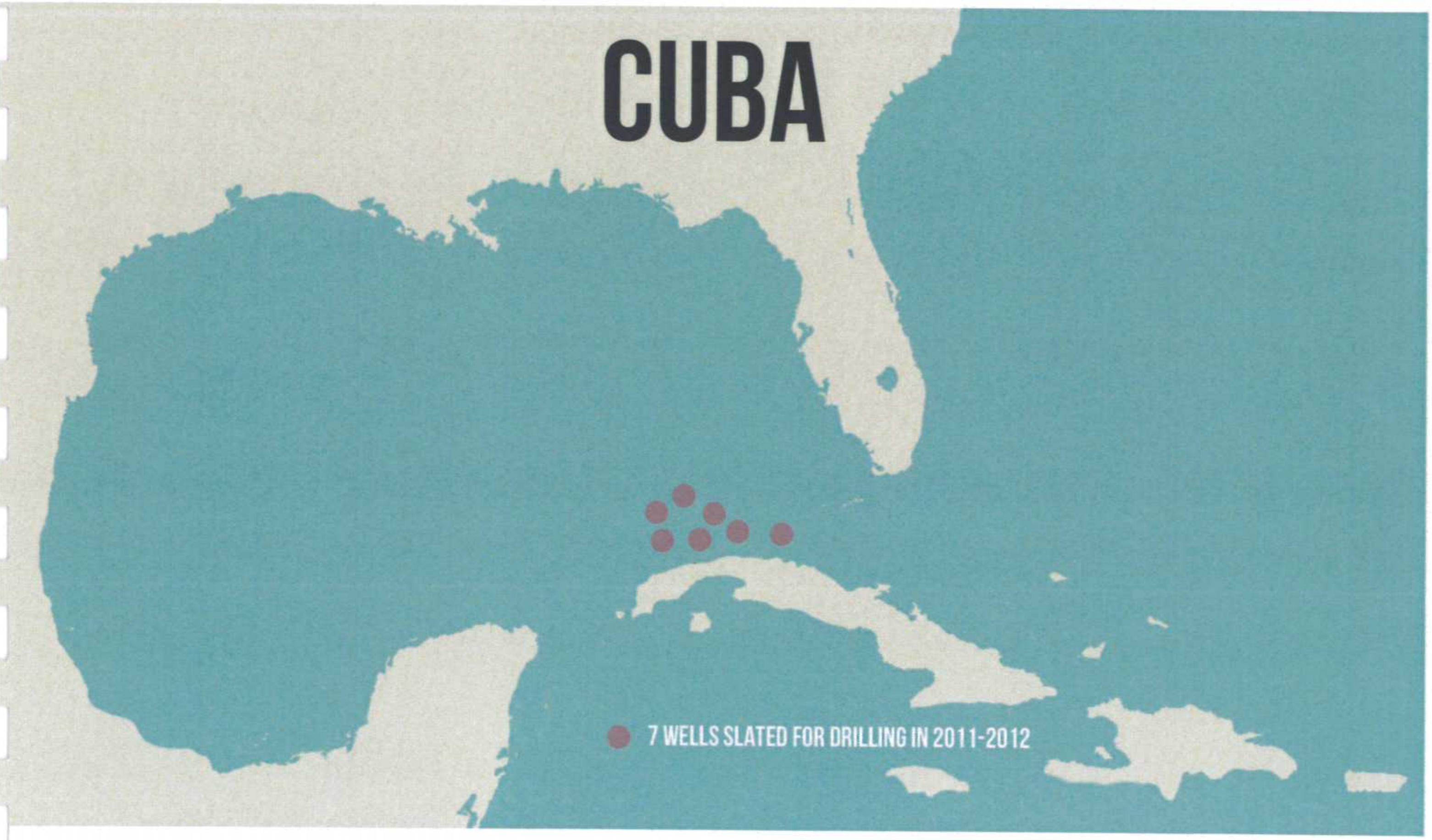


Fig. C




CUBA
7 WELLS SLATED FOR DRILLING IN 2011-2012


59 LEASES AVAILABLE IN CUBA
KEY WEST, FLORIDA
50 MILES
CUBA
LEASES ALREADY EXECUTED BY THE FOLLOWING COUNTRIES:
VENEZUELA
BRAZIL
NORWAY
VIETNAM
ANGOLA
CHINA
MALAYSIA
SPAIN
UNDER NEGOTIATION


THE BENEFITS
190
VS.
6,000
PROVIDING A HIGHLY EFFICIENT & OVERWHELMING RESPONSE WITH ONLY 190 VESSELS INSTEAD OF MORE THAN 6,000 AS REGISTERED DURING THE DEEP WATER HORIZON SPILL
MINIMIZING THE USE OF TOXIC DISPERSANTS
AVOIDING AIR POLLUTION & CARBON EMISSIONS ASSOCIATED WITH BURING BOOMED OIL
PROTECTING & PRESERVING THE HEALTH OF THE GULF COAST BEACHS & ECOSYSTEMS
RETURNING SKIMMED WATER BACK TO THE OCEAN AT UNDER 15 ppm (EXCEEDING EPA REGULATIONS)
ELIMINATING DISPOSAL OR INCINERATION OF HAZARDOUS WASTE ABSORBENT MEDIA
THE TRANSPORT OF SHALLOW WATER SKIMMING VESSELS THAT CAN BE TRUCKED OR AIRLIFTED TO A SPILL SITE TO ENSURE SHORELINE PROTECTION

The Role of Advanced Oil-Water Separation Technology in Oil Spill Response

A White Paper by:

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Introduction

Historically, oil spill containment and recovery technologies have been limited to aerial application of dispersants or booming of surface oil slicks followed by burning, soaking up with absorbent media, or skimming onto oil spill recovery vessels. During the recent BP Deepwater Horizon oil spill, the oil spill response was comprised of: (1) application of chemical dispersants, (2) absorption of boomed oil, (3) burning (weather permitting) of boomed oil, and (4) skimming (recovery) of boomed oil.

Chemical dispersants do not "recover" spilled oil or make it go away and dispersants make surface oil drop below the water surface and break up one large oil slick into many smaller oil slicks that are harder to find, collect, and recover.[1] Peer-reviewed toxicological research suggests that the use of COREXIT 9500 (the dispersant used by BP in the Gulf of Mexico) did not significantly change the toxicity of spilled oil in Prudhoe Bay, Alaska (i.e., the Exxon-Valdez oil spill).[2] Therefore, dispersants offer no intrinsic environmental benefit, but they do make oil spill containment and oil recovery substantially more difficult, if not impossible. Moreover, dispersants largely eliminate the visual impact of oil slicks on water, providing a public relations benefit to the responsible party.

A plane releasing dispersant over the Gulf

Burning of collected oil

[1] Oil treated with dispersant chemicals sinks below the water surface. At some point (days to years later), the pressure and temperature of deep ocean water will likely cause dispersants to release the emulsified oil droplets, and the oil will slowly re-surface and work its way to the shore as slicks and tarballs. Therefore, continuous oil cleaning operations of the shoreline may be ongoing for years.

[2] Anderson, B. S.; Arenella-Parkerson, D.; Phillips, B. M.; Tjeerdema, R. S.; Crane, D., Preliminary investigation of the effects of dispersed Prudhoe Bay Crude Oil on developing topsmelt embryos, *Atherinops affinis*. *Environmental Pollution*, **2009**, *157*, (3), 1058-1061.

Burning boomed oil converts spilled oil into airborne CO_2, partially combusted hydrocarbons (often carcinogenic), soot particles, and other petroleum combustion byproducts (NOx, SOx, CO, etc.). Like dispersants, burning boomed oil offers little environmental benefit and creates additional hazards. Using absorbent media to recover boomed oil does extract spilled oil from the water. It also creates a new form of hazardous waste (absorbent + oil) that must be safely disposed or incinerated. As with dispersants and burning, absorbent media offers minimal environmental benefit, as this approach increases the load of toxic materials in landfills and/or air pollution created from hazardous waste incineration.

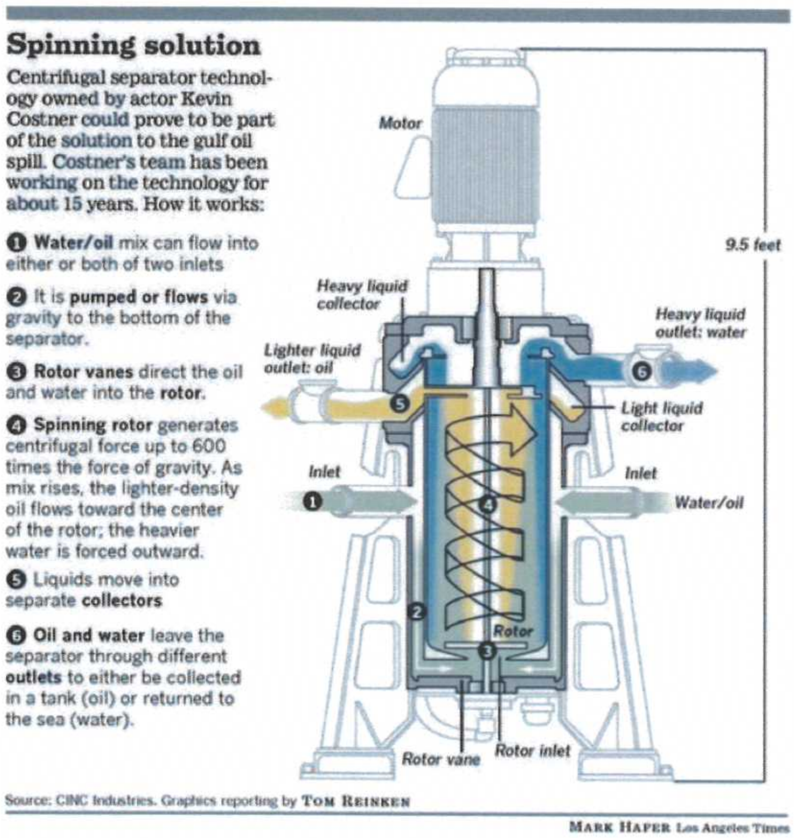
Water and oil crashing over booms

A dead turtle covered in oil

More than 17 years ago, Ocean Therapy Solutions LLC (OTS) co-founder Kevin Costner recognized that neither dispersants nor burning and absorbing boomed oil served the purpose of ecosystem protection and environmental preservation, which are (in principle) the primary motivation for oil spill response. It was evident that oil spill response must involve an overwhelming first response by a large number of oil spill recovery vessels (OSRV) with advanced collection and storage capabilities. In response to the BP Deepwater Horizon oil spill, OTS was formed with the objective of bringing state of the art oil spill recovery technology to the fight to protect and help clean up the Gulf of Mexico. The successes and lessons learned by OTS in the Gulf cleanup can help the U.S. government establish new standards for improving our nation's ability to respond to future oil spills.

Company History

Over 30 years ago, scientists at the U.S. Department of Energy's Idaho National Energy Laboratory developed a small laboratory scale centrifuge apparatus for separating minerals from water. This led to a U.S. patent application being filed in 1990. In 1993, Costner Industries Nevada Corporation (now called CINC Industries, Inc., "CINC") was issued a congressional mandated technology transfer for the patent rights. After two years of additional research and development, the centrifuge technology was modified and scaled-up to enable highly effective liquid-liquid separations at rates of up to 200 gallons per minute (gpm). CINC invested over $20 million to further develop and improve the centrifugal technology for environmental cleanup and the economical recovery of valuable resources.



Detail of CINC centrifuge technology.

CINC's liquid-liquid centrifugal separator technology utilizes the force generated from rotating an object around a central axis. By spinning two fluids of different densities within a rotating container heavier fluids are forced to the exterior walls of the rotor while lighter fluids are forced to the center. The resulting separation yields water with up to 99.99 percent purity depending on the nature of the spilled oil and the quality of the receiving water body. CINC units are highly portable and capable of handling both small and large volumes of oil and water between 2 and 200 gallons per minute. Additionally, this separator can handle changes in liquid ratios from 10/1 oil/water to 10/1 water/oil without any loss of efficiency. Their performance can also be adapted (in real-time) to fluctuations in flow rate, water quality and temperature. CINC's ability to achieve both high throughput and high purity across a dynamic range of influent conditions cannot be duplicated by any comparable system.

OTS Innovations in Oil Spill Recovery Technology

Historically, oil spill containment and recovery technologies have been limited to the application of chemical dispersants or burning, absorbing, and skimming boomed oil. If environmental protection and preservation are the primary motivations for current and future oil spill response plans, it is critically important that oil spill response technology is improved. The most environmentally responsible and effective approach is to mount an overwhelming booming and skimming operation in response to an oil spill. Traditionally, this has been limited by the abundance, effectiveness, and efficiency of Oil Spill Response Vessels (OSRVs) that can be deployed in addition to the quality of booming and skimming technology.

In response to the BP oil spill in the Gulf of Mexico, OTS and its teaming partners: CINC, University of California Los Angeles (UCLA), D&L Salvage (DNL), Hornbeck Offshore Services (HOS), Edison Chouest Offshore (ECO), and CCS Midstream Services (CCS)—designed and constructed advanced oil-water separation technology on board 6 OSRVs based on the CINC centrifuge. This new OSRV-mounted oil-water separation technology increased the efficiency of oil spill recovery operation because it allowed skimming vessels to store on board nearly unadulterated crude oil rather than traditional oil-water skimmings, which can be >90% water depending on the efficiency of the booms and skimmers employed.[3] The reduced volume of skimmed liquid stored onboard the OSRVs allows skimming vessels to operate longer, before having to offload their cargo. In addition, the quality of the recovered oil is improved, increasing the reclamation value of this precious resource.

[3] In Gulf of Mexico oil spill recovery operations CINC V20 centrifuges produced oil with less than 6% water content from skimmed oil containing ~50% to ~80% water (highly stable water-in-oil emulsions resulted from application of the chemical dispersant by BP) in addition to whatever free water was brought on board by the skimmers. The water phase from V20's contained between 20 (min) and 93 (max) ppm residual oil & grease.

Two CINC V-20's installed on the D&L Salvage's spud barge the Splash (left) and four CINC V20's installed on the Chouest platform service vehicle ELLA G (right)

Representative performance data from OSRV-mounted V20's deployed in the Gulf are presented in **Table 1** for the HOS oil barge Energy 8001 and the ECO platform service vessel Ella G. The effluent data represent averages plus or minus one standard deviation from more than 14 different samples. The influent total oil-water ratio varied from ~90% (Ella G) to ~55% (Energy 8001), and hence, the volume reduction of skimmed oil-water mixtures ranged from ~45% to ~90%. The performance of the centrifuges was consistent despite oil skimmings, despite highly variable influent water contents and states of chemical dispersion, plus different ages and extents of volatilization, weathering, biodegradation, and photodegradation. Due to the time required to produce centrifuges, booms and skimmers and to modify and outfit the barges and supply vessels into advanced OSRVs, limited oil recovery operations were conducted by these OSRVs up to this point in July. Oil recovery operations are ongoing using two D&L OSRVs (Hammerhead and Splash), two HOS OSRVs (Energy 8001 and Energy 13501), and two ECO OSRVs (Ella G and Ingrid).

CINC's centrifuge represents one critical and previously missing component in our nation's oil spill containment and recovery solution. However, recognizing that the centrifuge alone was not a complete solution, OTS worked with its teaming partners to develop two additional, critically important innovations. The first was an in-line chemical injection system to deliver demulsifying chemicals to skimmed oil-water mixtures that enabled processing of "peanut butter-like" oil collected from the Gulf of Mexico. The second was a polishing filtration process to remove the fraction of oil that could not be removed by the centrifuge, which includes highly emulsified and/or water-soluble oil hydrocarbons.

Table 1. Representative performance of CINC V20s deployed in the Gulf as of July 21, 2010

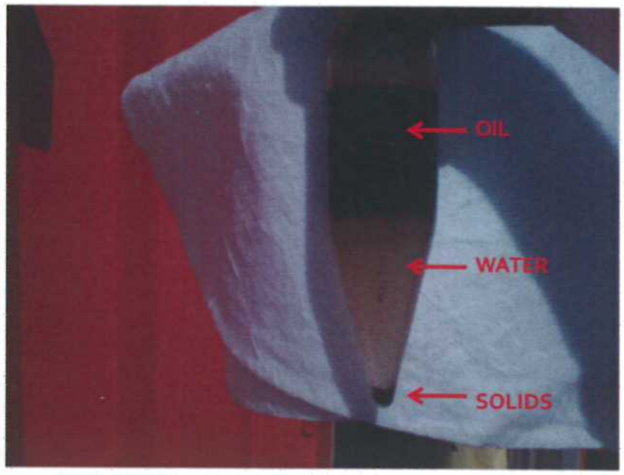
OSRV Name -	Total Volume Processed (bbl)	Influent Oil BS&W * (%)	Effluent H_2O TOG ** (ppm)	Efluent Oil BS&W * (%)
Ella G	310	90	76 ± 3	n.d.
Energy 8001	885	100	56 ± 29	n.d.

BS&W = bottom solids and water content of oil
TOG = total oil & grease per EPA Method 1664
n.d. = non-detect

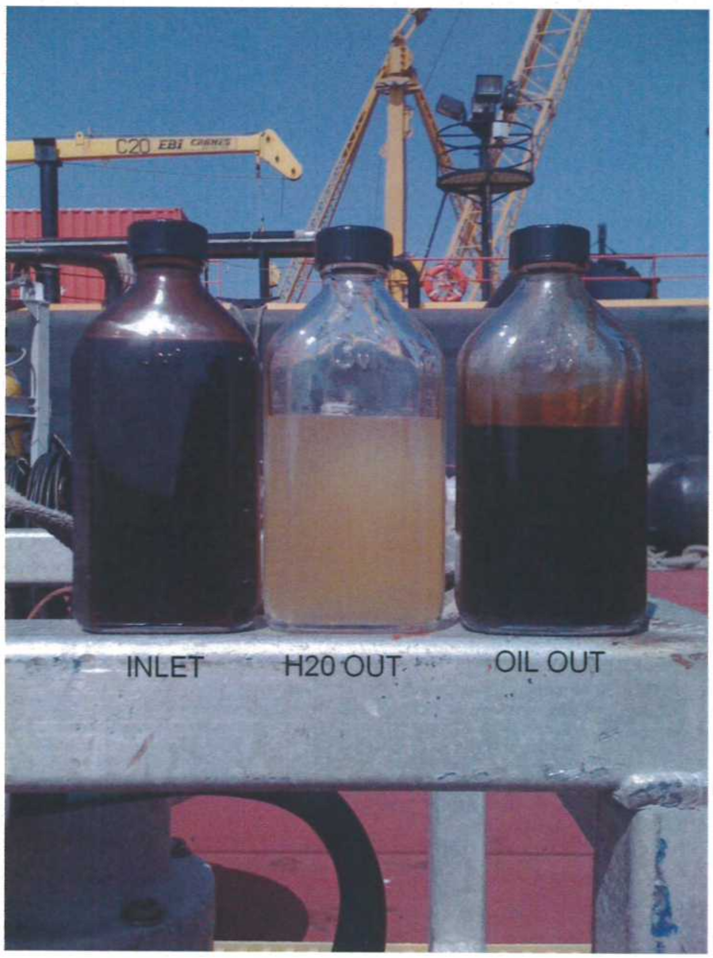
Oil Emulsion Breaking Technology

Oil spilled in the Gulf of Mexico experienced a wide range of physical, chemical, and biological interactions resulting in a wide range of properties for recovered oil. For example, in some cases we experienced a "peanut butter-like" form of recovered oil that could not be pumped or processed because of its extreme viscosity. The "peanut butter" sludge could have resulted from a combination of factors such as (1) oil mixing with chemical dispersants at the source of the leak, (2) extra mixing and turbulence over the ~5000 ft upward rise, (3) additional mixing due to wave action, and (4) various photochemical and microbiological transformations.

Laboratory experiments at UCLA reproduced the "peanut butter-like" oil sludge by rapidly mixing oil with dispersants in seawater for ~4 hours (see figure below, left), which suggests the key factors are mixing and dispersant addition. The "peanut butter" substance is a chemically stabilized water-in-oil emulsion that cannot be separated by any mechanical means. The laboratory prepared "peanut butter" contained 82% water and 18% oil. These experiments were followed by additional experiments conducted in collaboration with CCS and M-I SWAKO to develop a proprietary chemical demulsifying compound. Below at right is a picture of the shakeout tube to visually demonstrate the amount of oil, water, and solids entrained in Gulf oil spill "peanut butter-like" oil sludge. The separation occurred after the addition of the chemical demulsifier followed by laboratory centrifugation. Doses up to 300 ppm are safe according to EPA toxicity tests that were run week of July 12, 2010.



Picture (left) of "peanut butter-like" recovered oil observed in the Gulf oil spill response and (right) oil/water/solids broken out using proprietary chemical de-emulsifying compound. Note: the "peanut butter oil" shown at left was produced in a laboratory by vigorous shaking of oil and seawater mixed with chemical dispersant SDS, while the image at right was taken in the field in the Gulf of Mexico.



Picture of demulsfied peanut butter-like oil (INLET) and CINC V20 effluent water (H2O OUT) and oil (OIL OUT).

After the success of these laboratory experiments, we ran three tests in the field on the HOS Energy 8001 OSRV. First, we injected the chemical demulsifier to break the peanut butter emulsion into a flowable liquid and then collected water samples from the CINC V20. The influent contained 50-60% oil with 40-50% "basic sediments and water" (BS&W), while the effluent water contained 76-100 ppm of "oil and grease" (per EPA 1664 hexane extraction method) and effluent oil contained less than 6% BS&W. The centrifuges were run without any fine-tuning due to the limited volume of fluid and available chemical. Pictures of centrifuge influent and effluent from this test are provided below. Next, the demulsifier injection system was shut off and centrifuge tests with no chemical addition produced zero separation, all fluid exited the centrifuge through the oil outlet. Finally, the system was purged and demulsifier injection was turned on. Separation of oil and water re-commenced as in the initial test. It should be noted that BP did not authorize the use of chemical demulsifiers in any live oil spill recovery operations. The chemical demulsifier was used only for the closed-loop 'field test' to validate the effectiveness of this approach. No fluids were discharged to the ocean from this test.

Oil Polishing Filtration Technology

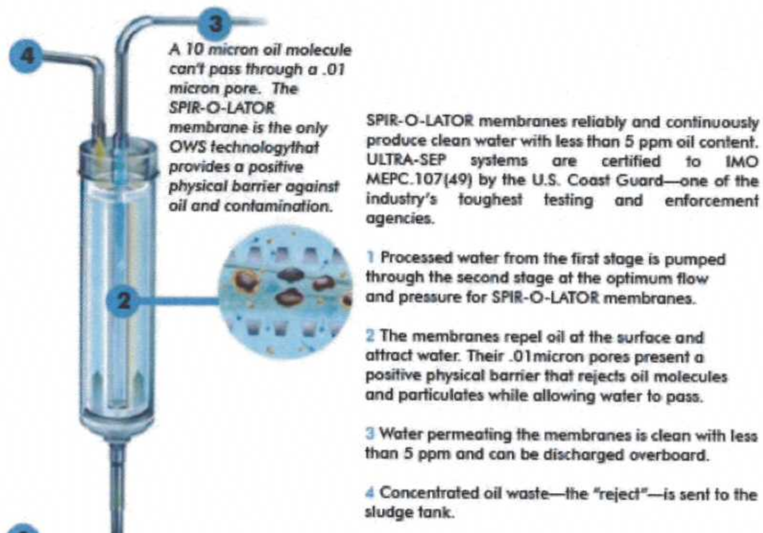
To improve the quality of the water extracted from the skimmed oil-water mixtures and to enhance environmental protection, OTS evaluated four polishing filtration technologies: nutshell media filters, organoclay media filters, a coalescer-filter, and an ultrafiltration membrane system. In preliminary field tests, the membrane based polishing filter worked best removing the total oil and grease content of the centrifuge effluent water down to non-detectable levels (**Table 2**). The other filtration technologies did remove some oil, but results were highly variable and did not achieve the target level of less than 15 ppm, which is the international and USEPA standard for discharge of oily wastewater from marine vessels.

Ultimately, OTS sought out a strategic alliance with Compass Water Solutions (CWS) not only because of the excellent performance of their membrane filtration process, but also because CWS has decades of experience in marine, offshore and industrial oily water separations. Beginning in Compass Water Solutions' corporate, research, and manufacturing facilities located in Irvine, California, CWS' Spir-O-Later™ membrane technology was adapted for removal of highly stabilized oil-in-water microemulsions and even some water soluble hydrocarbons from centrifuge effluent on board OSRVs deployed in the Gulf.

Table 2. Results from polishing filter tests

Polishing Filter Technology (description)	Onsite Influent * (ppm)	Onsite Effluent * (ppm)	Laboratory Influent ** (ppm)	Laboratory Effluent ** (ppm)
CINC V20***	40-50%	n.p.	n.p.	76 to 100
Membrane	76 to 100	n.d.	n.d.	n.d.
Organoclay	180	18	189 to 220	8 to 34
Nutshell	160 to 194	10 to 73	n.p.	n.p.
Coalescer	104 to 184	86 to 88	n.p.	n.p.

* Vertrel extraction with a Wilks IR analyzer onsite at CCS Midstream Services
** EPA 1664 - gravimetric hexane extraction analaysis for oil & grease
*** CINC influent by BS&Ws
n.d. = not detectable
n.p. = not performed



Detail of Compass Water Systems' Spir-O-Lator® membrane process.

The CWS membrane system is certified by the U.S. Coast Guard (satisfying IMO standard MEPC.107-49) and by the American Bureau of Shipping (ABS), and is currently in use on all major workboat fleets in the Gulf of Mexico for bilge water treatment. In fact, the U.S.

Coast Guard and ABS approved water polishing filtration technology that guarantees a water discharge with less than 15 ppm of residual oil, satisfying all known international, U.S., state, and local government regulations for discharge of oily wastewater from marine vessels.[4] The existing system is outfitted with online monitors and controls that prevent discharge of any water with more than 15 ppm of oil.

Pictures of the Energy 13501 Oil Barge now converted into the world's most advanced oil spill recovery vessel (left) and the integrated centrifuge and membrane treatment system (right).

The team of OTS, UCLA, CWS, CINC, CCS, and HOS recently developed an oil spill recovery vessel (OSVR) with an integrated centrifuge-based oil-water separation and membrane-based water polishing system. The first generation of the integrated centrifuge-membrane oil-water separation and water purification system is currently being deployed in the Gulf of Mexico on the Hornbeck oil barge Energy-13501, which is now one of the world's most advanced oil spill response vessels. This state of the art OSRV is currently being deployed in the Gulf and we await real-time performance data. Looking towards the future, the combination of centrifuge and membrane technologies can be used to satisfy existing discharge limits or to justify more stringent discharge limits for offshore drilling, production, transportation, and oil spill response.

Summary of Results in the Gulf

The assembled technical personnel from OTS, CINC, UCLA, and CWS have a combined 50+ year history of independently developing the world's most advanced centrifuge and

[4] Per IMO 9377-2:2000 Water Quality-Determination of hydrocarbon oil content index-Part 2: Method using solvent

membrane based oil-water separation technology and, more recently, developed an integrated centrifuge and membrane oil-water separation and water purification system to produce the world's most advanced OSRV-mounted oil spill response technology. This technology defines the state of the art in oil spill response and can eliminate environmentally irresponsible practices of applying chemical dispersants, burning boomed oil, and using oil adsorbent media, all of which increase costs and environmental risks.

Advantages of incorporating this advanced OSRV-mounted oil spill response technology into oil spill response programs include:

(1) reducing the appearance of tarballs on beaches;

(2) avoiding air pollution and carbon emissions associated with oil burning;

(3) virtually eliminating hazardous waste disposal of absorbent media;

(4) increasing the efficiency of oil spill recovery operations;

(5) improving the quality of recovered oil;

(6) returning skimmed water back to the ocean at under 15pmm; and

(7) enabling discharge water to meet or exceed existing environmental standards.

It is imperative that the U.S. government identifies the ***best available technologies*** for enhancing future oil spill response capabilities. Although the advanced OSRV-mounted oil-water separation and water purification technology described herein represents only one element of a much larger oil spill response recovery program, the integrated system developed in the Gulf by OTS and its teaming partners (vessel, boom, skimmer, centrifuge, and membrane) now defines the state of the art and the best available technology for oil spill recovery and environmental protection.

Blue Planet Solutions LLC is a new company, founded by Kevin Costner and key contributors in the Gulf cleanup project, with the mission of bringing this advanced oil-water separation technology to the world.

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extraction & gas chromatography (a.k.a., EPA 1664).